

# Temperature management risks during sea-freight export of mangoes to Asia

Monitoring of commercial mango export supply chains over the past two seasons has identified a number of instances of poor temperature management that can impact on the fruit quality upon arrival in Asian countries. Poor temperature management can occur at most steps in the supply chain, from farm to retailer, as summarised in the following table.

SUPPLY CHAIN	RISK
<b>Pack shed departure</b>	Uneven cooling of produce during consolidation and storage/cooling on farm. No precooling of trucks before loading
<b>During transport</b>	Inadequate refrigeration capacity or airflow to maintain even fruit temperatures through the load
<b>At freight forwarder</b>	Inadequate or no cooling while coordinating quarantine inspection and loading into air or sea containers
<b>Holding at departure terminal</b>	Inadequate or no cooling
<b>During sea shipment</b>	Uneven temperature differences of up to 5°C between the inside and outside of pallets for around 20 days can trigger significant ripening of fruit deeper inside the load (up to 15°C differences in air shipments)
<b>Arrival, holding at destination terminal</b>	Fruit often stays at the ambient temperatures (often near or below 0°C in e.g. China and South Korea) whilst quarantine inspections are undertaken
<b>At importer</b>	Inadequate or poor temperature management as consignments are split for local buyers and retailers
<b>Transit to retailer</b>	Inadequate management or ambient temperatures depending on mixed nature of loads
<b>In storage or on display at retailers</b>	The local ambient temperature can be quite hot or quite cold depending on the destination and whether the retail stores are air conditioned at night

Figure 1 (page 23) illustrates temperatures at three positions within a pallet after vapour heat treatment and forced air cooling through to arrival in Beijing. Air temperatures around the fruit reached the recommended 12°C following forced air cooling. Temperatures increased in the middle and top of the pallet en-route to the port, and then stayed relatively consistent through the sea journey to Shanghai.

Scott Ledger, Quality and Export Manager at Manbulloo, said that customers usually want seven to ten days shelf life after arrival to allow for sale and distribution to retailers. With the preferred ripeness to be no more than 50% skin yellowing and the fruit to be still firm.

When removed from the container the fruit were riper than expected with an average skin colour of 70% yellowing and the firmness was sprung to firm soft. The temperature monitoring showed that the middle and top of the pallet were 2-3°C higher than optimum, which resulted in the fruit being advanced in ripeness. Fortunately, demand was strong and most of the shipment was distributed within five days of unloading the container.

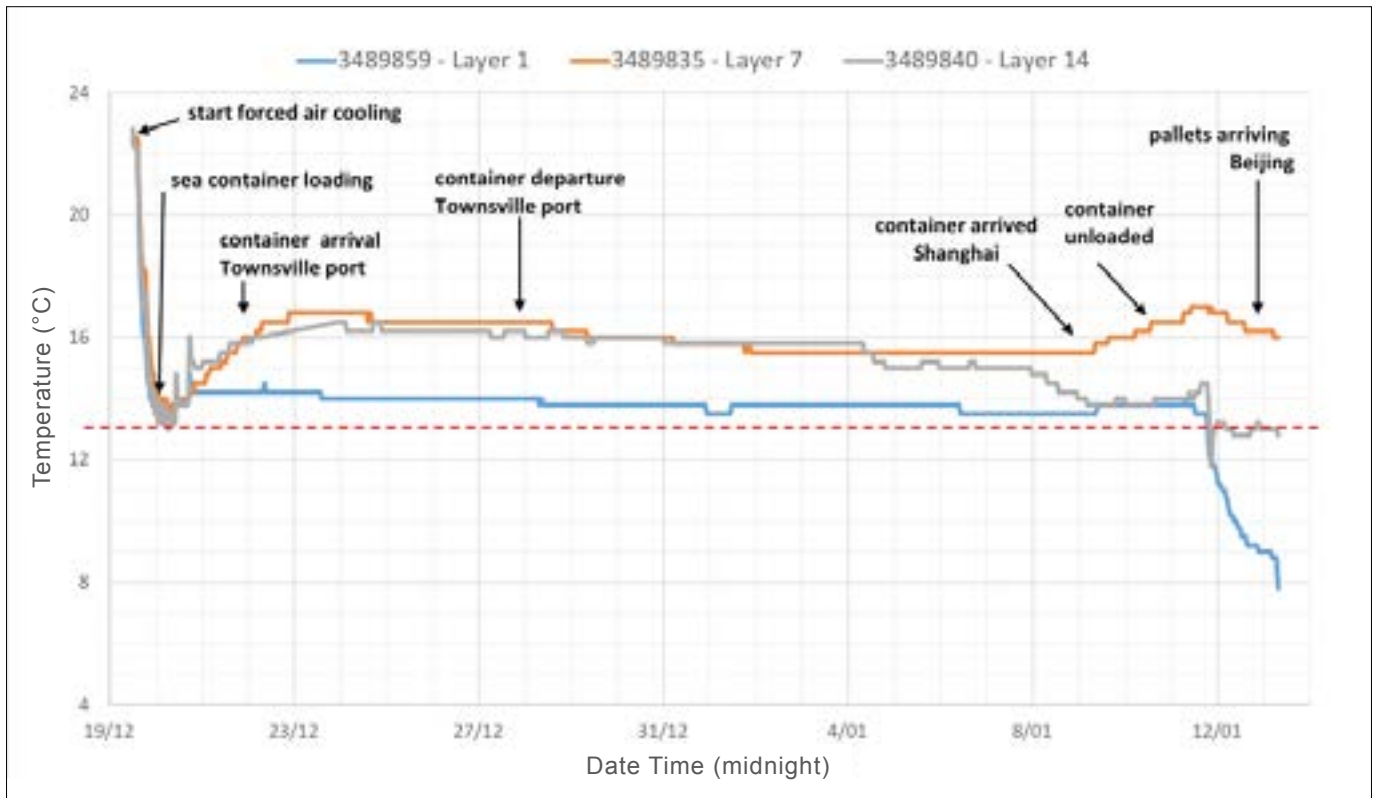
*Acknowledgements: The Serviced Supply Chains project is funded by the Hort Frontiers Asian Markets Fund, part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation, with co-investment from the Department of Agriculture and Fisheries, Queensland (DAF),*

*Department of Economic Development, Jobs, Transport and Resources (Victoria), The University of Southern Queensland, Manbulloo (mangoes), Montague Fresh (summerfruit), Glen Grove (citrus) and contributions from the Australian Government.*

*Article submitted by Noel Ainsworth and Yiru Chen from DAF.*

*For more information contact: Noel Ainsworth, Principal Supply Chain Horticulturist, at DAF; [noel.ainsworth@daf.qld.gov.au](mailto:noel.ainsworth@daf.qld.gov.au) or (07) 3708 8563.*

*Continued page 23*



**Figure 1:** Air temperatures in layer 1 (bottom of pallet), layer 5 (middle) and layer 14 (top) in a seafreight consignment from North Queensland to Beijing (China) via Shanghai (courtesy of Manbulloo). The pallet was unloaded at Shanghai and road-freighted to Beijing.